

Lesion-Aware Visual Explanation for Apple Leaf Disease Detection using Grad-CAM

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Company Name

Date



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We had to Design, implement, and quantitatively evaluate a pipeline that validates whether a CNN truly focuses on disease lesions when classifying apple-leaf diseases

Objectives

Model & Explainability:

- Pre-trained ResNet50
- Grad-CAM heatmap generation

Dataset:

- 1306 apple leaf images with pixel-wise lesion masks

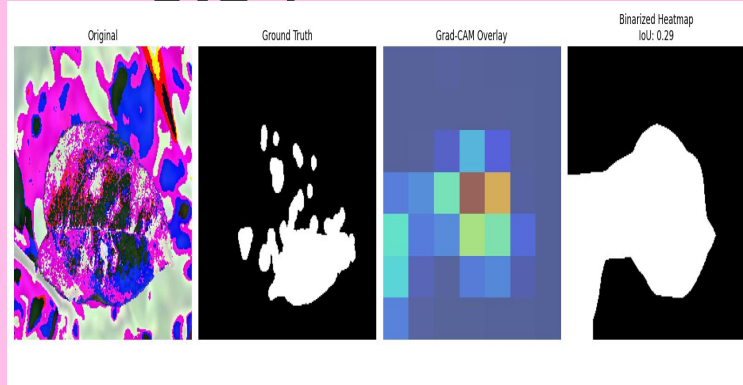
Pipeline Steps:

- Resize images/masks to 224×224
- Generate Grad-CAM
- Threshold heatmap at 0.1 \rightarrow binary mask
- Compute IoU with ground truth masks

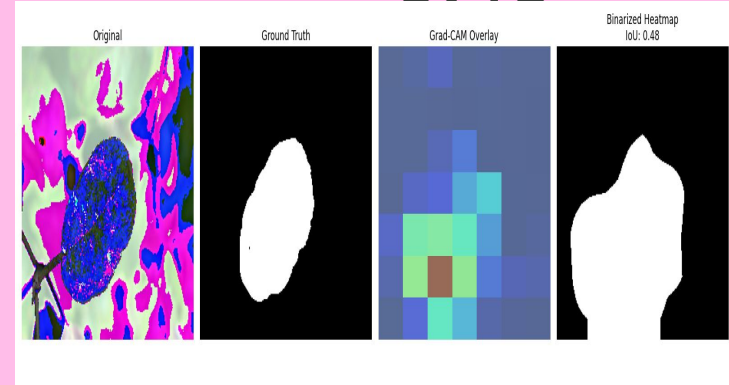
Methodology

Top IoU scores

0.34



0.48



Results

Mean score - 0.0206

- Grad-CAM provides coarse but meaningful lesion localization
- Most IoUs are low, but some demonstrate strong alignment

- **Future directions:**

- Grad-CAM++ for sharper heatmaps
- Fine-tune a segmentation model (e.g., U-Net)
- Per-disease class analysis

Conclusion